CLAIMS

What is claimed is:

1. A method of reducing a pathogenic effect caused by stress in a subject, comprising administering to the subject a composition that increases a concentration of an intracellular metabolite of a hexosamine biosynthetic pathway, as compared to the concentration of the intracellular metabolite in the absence of the composition, the increase in the concentration of the intracellular metabolite of the hexosamine biosynthetic pathway reducing the pathogenic effect of the stress in the subject.

2. The method of claim 1, wherein the stress is not associated with a hyperactivated inflammatory response.

3. The method of claim 1, wherein the increase in the concentration of the intracellular metabolite inhibits cellular calcium overload.

4. The method of claim 1, wherein the intracellular metabolite is uridine diphosphate-*N*-acetylglucosamine.

5. The method of claim 1, wherein the composition comprises an inhibitor of *O*-*N*-acetyl glucosaminease (*O*-GlcNAcase).

6. The method of claim 5, wherein the inhibitor comprises *O*-(2-acetamido-2-deoxy-D-glucopyranosylidene)amino-*N*-phenylcarbamate (PUGNAc).

7. The method of claim 1, wherein the composition comprises glucosamine, *N*-acetylglucosamine, or a pharmaceutically acceptable salt or a polymer thereof.

8. The method of claim 1, wherein the composition comprises glutamine or a pharmaceutically acceptable salt thereof.

9. The method of claim 1, wherein the composition comprises fructose-1,6-bisphosphate or a pharmaceutically acceptable salt thereof.

10. The method of claim 1, wherein the composition comprises any combination of glucosamine, *N*-acetylglucosamine, glutamine, fructose-1,6-bisphosphate, *O*-(2-acetamido-2-deoxy-D-glucopyranosylidene)amino-*N*-phenylcarbamate, or a pharmaceutically acceptable salt or a polymer thereof.

11. The method of claim 1, wherein the composition is administered to the subject prior to, during, or after the stress.

12. The method of claim 1, wherein the stress is caused by ischemia.

13. The method of claim 1, wherein the stress is caused by hemorrhage.

14. The method of claim 1, wherein the stress is caused by hypovolemic shock.

15. The method of claim 1, wherein the stress is caused by myocardial infarction.

16. The method of claim 1, wherein the stress is caused by stroke.

17. The method of claim 1, wherein the stress is caused by a medical procedure.

18. The method of claim 17, wherein the medical procedure is an interventional cardiology procedure.

19. The method of claim 17, wherein the medical procedure is cardiac bypass surgery.

20. The method of claim 17, wherein the medical procedure is fibrinolytic therapy.

21. The method of claim 17, wherein the medical procedure is angioplasty.

22. The method of claim 17, wherein the medical procedure is a stent placement.

23. The method of claim 1, wherein the composition comprises a solution of from about 0.1 mM to about 1 M glucosamine in about 100% to about 50% Ringer's lactate.

24. The method of claim 1, wherein the composition is administered over a period of from about 5 minutes to about 1 hour.

25. The method of claim 1, wherein the subject is a mammal.

26. The method of claim 25, wherein the mammal is a human.

27. A method of preserving a cell, tissue, or organ transplant in a transplant recipient, comprising:
    a. contacting the cell, tissue, or organ transplant with a composition that increases a concentration of an intracellular metabolite of a hexosamine biosynthetic pathway, as compared to the concentration of the intracellular metabolite in the absence of the composition; and
    b. transplanting the cell, tissue, or organ into the recipient, the increase in the concentration of the intracellular metabolite of the hexosamine biosynthetic pathway preserving the cell, tissue, or organ transplant in the transplant recipient.

28. The method of claim 27, wherein the contacting step is performed prior to the transplantation step.

29. The method of claim 27, wherein the contacting step is performed during the transplantation step.

30. The method of claim 27, wherein the contacting step is performed after the transplantation step.

31. The method of claim 27, wherein the organ transplant is a heart.

32. The method of claim 27, wherein the composition comprises any combination of glucosamine, *N*-acetylglucosamine, glutamine, fructose-1,6-bisphosphate, *O*-(2-acetamido-2-deoxy-D-glucopyranosylidene)amino-*N*-phenylcarbamate, or a pharmaceutically acceptable salt or a polymer thereof.

33. The method of claim 27, wherein the composition comprises glucosamine, glucosamine polymer, or a pharmaceutically acceptable salt thereof.

34. The method of claim 27, wherein the composition comprises glucosamine, glucosamine polymer, or a pharmaceutically acceptable salt thereof in a concentration of from about 0.1 mM to about 1 M.

35. The method of claim 27, wherein the intracellular metabolite is uridine diphosphate-*N*-acetylglucosamine.

36. The method of claim 35, wherein the concentration of uridine diphosphate-*N*-acetylglucosamine is increased by about 75%, 30 minutes after contact with the composition.

37. The method of claim 35, wherein the concentration of uridine diphosphate-*N*-acetylglucosamine is increased by about 50%, 10 minutes after contact with the composition.

38. The method of claim 35, wherein the concentration of uridine diphosphate-*N*-acetylglucosamine is increased by about 20%, 10 minutes after contact with the composition.

39. The method of claim 27, wherein the intracellular metabolite is glucosamine-6-phosphate.

40. A method of preserving a cell, tissue, or organ culture, comprising contacting the cell, tissue, or organ culture with a composition that increases a concentration of an intracellular metabolite of a hexosamine biosynthetic pathway, as compared to the concentration of the intracellular metabolite in

the absence of the composition, the increase in the concentration of the intracellular metabolite of the hexosamine biosynthetic pathway preserving the cell, tissue, or organ culture.

41. The method of claim 40, wherein the composition comprises any combination of glucosamine, *N*-acetylglucosamine, glutamine, fructose-1,6-bisphosphate, *O*-(2-acetamido-2-deoxy-D-glucopyranosylidene)amino-*N*-phenylcarbamate, or a pharmaceutically acceptable salt or a polymer thereof.

42. The method of claim 40, wherein the composition comprises glucosamine, glucosamine polymer, or a pharmaceutically acceptable salt thereof.

43. The method of claim 40, wherein the composition comprises glucosamine, glucosamine polymer, or a pharmaceutically acceptable salt thereof in a concentration of from about 0.1 mM to about 1 M.

44. The method of claim 40, wherein the intracellular metabolite is uridine diphosphate-*N*-acetylglucosamine.

45. The method of claim 44, wherein the concentration of uridine diphosphate-*N*-acetylglucosamine is increased by about 75%, 30 minutes after contact with the composition.

46. The method of claim 44, wherein the concentration of uridine diphosphate-*N*-acetylglucosamine is increased by about 50%, 10 minutes after contact with the composition.

47. The method of claim 44, wherein the concentration of uridine diphosphate-*N*-acetylglucosamine is increased by about 20%, 10 minutes after contact with the composition.

48. The method of claim 40, wherein the intracellular metabolite is glucosamine-6-phosphate.